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Does Exercising with Another Enhance the Stress-Reducing Benefits of Exercise?

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This study sought to determine if the stress-reducing benefits of exercise are improved by exercising with others rather than alone. One hundred and thirty-six participants completed a series of questionnaires measuring levels of tension, calmness, energy, and tiredness before exercise, immediately following exercise, and later that day before bedtime. Participants exercised on a laboratory stationary bicycle for 30 minutes at moderate intensity either alone, with another person while talking, or with another person while remaining silent. A series of ANOVA procedures revealed that participants generally experienced more energy and calmness and less tiredness after exercise. Furthermore, exercising with someone resulted in more calmness but also more tiredness than when exercising alone. Males generally reported more positive psychological effects than females. Results suggest that exercise with someone may be calming but more tiring due to a potential increased competition or workload.

KEY WORDS: stress; coping; exercise; social support.

INTRODUCTION

Much research has focused on the relationship between exercise and both physical and mental health. Exercise has been linked to numerous physical health benefits such as improving weight, blood pressure, lowering the risks of cardiovascular disease and other illnesses, and even increasing longevity (Blair et al., 1989; Brill, Kohl, & Blair, 1992; Gauvin & Spence, 1995; Paffenbarger,

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Hyde, Wing, & Hsieh, 1986; Plante & Rodin, 1990; Plante, 1999). In addition to providing physical benefits, exercise has also been consistently found to be associated with an improvement in mood and the ability to cope with stress (Gauvin & Spence, 1995; Folkins & Sime, 1981; Plante & Rodin, 1990) as well as promoting emotional health and well being (Byrne & Byrne, 1993; Folkins & Sime, 1981).

While evidence of the physical and mental benefits of exercise abounds, there exists no single, coherent theory that adequately explains why—despite many proposed explanations. One biological explanation asserts that exercise increases body temperature, adrenal and steroid activity, as well as the release of certain neurotransmitters such as endorphins (e.g., Hughes, 1984; Michael, 1957; Von Euler & Soderberg, 1956, 1957; Ransford, 1982; Farrell, 1981; Markoff, Ryan, & Young, 1982). Another approach is psychosocial in origin and posits that exercise acts as a type of distraction (Long, 1983), biofeedback (Schwartz, Davidson, & Coleman, 1978), meditation (Buffone, 1980), or psychological buffer (Kobasa, Maddi, & Puccetti, 1982) and can result in an increased sense of self-efficacy, control, and mastery (Bandura, 1977; Marcus, Selby, Niaura, & Rossi, 1992). Furthermore, some researchers have suggested that many of the derived psychological benefits may be due to expectancy effects; that is, "people may demonstrate improvement in psychological functioning simply because they are expecting self-enhancement" (Folkins & Sime, 1981, p. 375).

Despite the numerous physical and psychological benefits of exercise and the many reasons for such improvements, two thirds of American adults do not engage in regular exercise (Jones & Ainsworth, 1998), and one quarter are sedentary (Centers for Disease Control and Prevention, National Center for Chronic Disease, 1996). Moreover, according to Frankish, Milligan, and Reid (1998), "accumulating evidence indicates that sedentariness is a risk factor for cardiovascular and other major diseases" (p. 287). Why, then, in light of the positive evidence for mental and physical benefits of exercise and the disadvantages of sedentariness, do most Americans fail to engage in regular activity? The answer remains quite complex. Frankish et al. assert that the relationship between health and active living has social, racial, emotional, and socioeconomic factors that affect an individual's decision to engage in an active lifestyle. Some of the major factors in their model of health promotion include age, gender, race, and social support.

Of particular importance to the present study is the role of social exercise (i.e., exercising with another person rather than alone) in the facilitation of mood improvement. For example, social support (generally from family or friends) has frequently been associated with effective long-term weight loss maintenance (Jeffery & Wing, 1999; Jeffrey et al., 2000). In a study designed to assess the positive benefits of social support on weight loss, Jeffery and Wing found that

those participants recruited alone for weight loss programs had a 76% completion rate and 24% maintained their weight loss, whereas those recruited with friends boasted a 95% completion rate and 66% maintained their weight loss in full for 6 months. Moreover, social support has been found to be helpful in smoking cessation; the most successful smoking cessation programs are those that are biopsychosocial and involve group support and social interventions (Hall, Munoz, Reus, & Sees, 1993; Hatsukami, Jensen, Allen, & Grillo, 1996; Hughes, 1993; Ockene, 1986).

Social support encourages people to engage in more healthy behaviors such as increasing adherence to medication regimens and increasing the likelihood that one will use health services (Kulik & Mahler, 1989). Moreover, social support has been found to improve psychological health in general by helping people cope with stress more successfully than they would without such support (Sarason, Sarason, & Gurung, 1997). The reverse of this also holds true: those who lack social support often experience higher levels of stress (Dunkel-Schetter & Wortman, 1981). Finally, social support also appears to decrease the likeliness of illness, and speeds recovery for those who are already ill (Kulik & Mahler, 1989; Wallston, Alagna, DeVellis, & DeVellis, 1983). These effects may be due in part to the beneficial nature of social support to the cardiovascular, endocrine, and immune systems (Seeman & McEwen, 1996; Uchino, Cacioppo, & Kiecolt-Glaser, 1996).

Since social support helps people lose weight and engage in more healthy behaviors, then exercising with others may not only help people maintain an exercise program but might also improve mood and psychological functioning. Specifically, exercise with others might improve psychological functioning due to the social support aspects of the activity. This might help to explain some of the reasons why exercise makes people feel better regardless of improved physiological changes that regular exercise provides. Although merely exercising with another person may not truly constitute social support, the social nature of group exercise (even with strangers such as in a health club) might contribute to an improved psychological effect.

The purpose of this study was to investigate further the contribution of social exercise on mood states. To our knowledge, no previous laboratory-based research has examined the relationship between social exercise and the psychological benefits of exercise. We define social exercise as completing an exercise workout in the presence of another exerciser doing the same activity (e.g., biking), with or without verbal communication between the participants. Participants completed a series of questionnaires examining mood states. Participants then were randomly assigned to one of three conditions: exercise alone (group 1), exercise with another person while not talking (group 2), and exercise with another person while talking (group 3). The rationale behind the differences of group 2 and 3 was to differentiate between the psychological effects of being

in the mere presence of another person (group 2) and actually interacting with another person (group 3). Participants then exercised for 30 minutes at a moderate level (i.e., 60–70% maximum heart rate) on an exercise bicycle; their mood states were then reevaluated. We hypothesized that exercising with someone would result in more positive mood changes (e.g., increased calmness, decreased tension) than exercising alone.

METHOD

Participants

The sample of 136 introductory psychology university students (48 males and 88 females) ranged in age from 18 to 28 years ($M = 18.94$, $SD = 1.32$). Participants had no injury or physical disability and were given course credit for their participation.

Measures

During the orientation session, participants completed several questionnaires which assessed their levels of calmness, tiredness, tension, and energy.

Perceived Physical Fitness Scale (*PPFS*). This scale (Abadie, 1988) consists of 12 items using a 4-point scale assessing the perception of physical fitness (e.g., I am in good physical condition). Internal consistency using Cronbach's alpha is reported to be .78, and test-retest reliability is reported to be .92. Abadie reported that the test has excellent construct and concurrent validity and is not related to social desirability.

Marlowe Crowne Social Desirability Scale (*M-C SDS*). This scale (Crowne & Marlowe, 1960) is designed to measure social desirability or defensiveness and consists of 33 true-false statements. The Marlowe Crowne SDS has been found to maintain adequate internal consistency (KR-21 = .75) and construct validity (Crowne & Marlowe, 1960; Strahan & Gerbasi, 1972). Since previous research has indicated that social desirability or defensiveness may bias self-report (e.g., Crowne & Marlowe, 1960; Snyder, Harris, Anderson, & Holleran, 1991; Weinberger, 1991), the present study included this measure to evaluate and control for social desirability and defensiveness with participants' responses.

Activation-Deactivation Adjective Check List (*AD-ACL*). The AD-ACL (Thayer, 1967, 1978, 1986) is a brief and frequently used self-report checklist designed to measure momentary mood states. Thayer (1978, 1986) reports that

the AD-ACL has adequate reliability and validity and has been validated in a number of psychophysiological and biopsychological investigations.

Procedure

In order to inform participants about the procedures of the study, students were provided with an orientation session prior to their participation. All participants signed a consent form and were asked to complete several questionnaires. On completion of the questionnaires, participants then signed up for an exercise session with a female research assistant. Participants were randomly assigned to one of three conditions: riding a stationary exercise bike alone, riding a bike with another person while talking, and riding a bike with another person while not allowed to talk. Prior to the actual exercise, participants filled out a questionnaire assessing their levels of calmness, tension, tiredness, and energy using the AD-ACL. Participants were instructed to get on an exercise bike and were then attached to a heart rate monitor that clipped to their earlobe. Participants' heart rates were continually monitored by the heart rate monitor, and they were instructed to stay within a heartbeat range of 120–150 to maintain a moderate level of exercise (i.e., 60–70% maximum heart rate). They were also instructed to maintain a conversation with their partner or were told to remain silent depending on which condition they were assigned. Participants in the alone condition were given no such instructions. Participants were then instructed to ride the exercise bike for the duration of 30 minutes, with the first 5 minutes being a warm up and the last 5 minutes a cool down period. After the exercise, participants immediately completed the AD-ACL, which measured their tension, calmness, energy, and tiredness. They were given the same questionnaire to take home and complete later that day before bed. Participants were instructed to return the completed questionnaire to a drop box in the psychology department the following day.

RESULTS

One hundred thirty-six participants were included in the data analysis. Means and standard deviations for age, perceived fitness, and social desirability by experimental condition and gender are shown in Table 1. AD-ACL mood scores (i.e., energy, tired, tension, calmness) assessed before and after exercise participation by experimental condition are presented in Table 2. Pearson product-moment correlation coefficients were calculated among salient variables and are reported in Table 3. Significant correlations are noted in the table. An examination

Table 1. Means and Standard Deviations for Age, Social Desirability, and Perceived Physical Fitness

	Condition[a]					
	1		2		3	
	Male	Female	Male	Female	Male	Female
Age						
Mean	19.88	18.67	19.39	18.81	18.92	18.56
SD	1.76	0.62	2.36	0.86	1.32	0.63
N	17	15	18	32	13	41
MC[b]						
Mean	12.41	14.27	14.83	14.41	16.31	15.2
SD	6.23	4.27	4.95	4.79	3.61	4.66
N	17	15	18	32	13	41
PPFS[c]						
Mean	34.71	30.47	38.83	33.53	33.15	31.83
SD	5.73	8.54	4.87	5.16	4.98	5.77
N	17	15	18	32	13	41

[a]Condition 1 = Exercise alone; Condition 2 = Exercise with someone, no talking; Condition 3 = Exercise with someone, with talking.
[b]MC = Score reflects defensiveness as measured by the Marlowe Crowne Scale. Scores could potentially range from 1–30.
[c]PPFS = Participants subjective reports of their estimated physical fitness levels as measured by the Perceived Physical Fitness Scale. Scores could potentially range from 12–48.

of the zero-order correlations revealed that perceived fitness and social desirability were unrelated to any of the AD-ACL mood measures (all p's > .05).

As a manipulation check, a series of within-subject repeated measure analysis of variance (ANOVA) procedures were conducted to ensure that participants generally felt better after exercise than before exercise. Participants generally experienced more self-reported energy and calmness and less tiredness as reported by AD-ACL mood scores following exercise than before exercise (all p's < .05). However, tension scores failed to reach statistical significance (p's > .05). Thus, exercise appeared to have an immediate positive impact on energy, calmness, and tired scores but not for tension scores.

ANOVA procedures were conducted to examine potential group differences in perceived fitness and social desirability. A 3 (Exercise Condition) × 2 (Gender) ANOVA conducted on the perceived fitness measure failed to reach statistical significance for any between-subject main or interaction effects. Thus, neither exercise condition nor gender were related to perceived fitness. A 3 (Exercise Condition) × 2 (Gender) ANOVA conducted on the social desirability measure also failed to reach statistical significance for any between-subject main or interaction effects. Thus, neither exercise condition nor gender was related to social desirability. Since neither perceived fitness nor social desirability was

Table 2. Means and Standard Deviations for Energy, Tired, Calm, and Tension Variables

	Condition					
	1		2		3	
	Male	Female	Male	Female	Male	Female
Before Exercise						
ENERGY1[a]						
Mean	13.65	12.60	12.00	11.78	11.00	10.66
SD	3.72	3.85	2.66	2.81	3.79	2.43
N	17.00	15.00	18.00	32.00	13.00	41.00
TIRED1[b]						
Mean	10.65	12.33	10.28	13.94	11.00	13.10
SD	4.21	4.20	3.85	4.23	4.38	3.88
N	17.00	15.00	18.00	32.00	13.00	41.00
CALM1[c]						
Mean	10.24	10.27	33.15	31.83	33.83	33.53
SD	3.29	3.28	4.98	5.77	4.87	5.16
N	17.00	15.00	18.00	32.00	13.00	41.00
TENSION1[d]						
Mean	9.18	9.60	8.44	9.03	8.31	8.83
SD	2.86	3.25	2.36	2.98	2.60	3.16
N	17.00	15.00	18.00	32.00	13.00	41.00
Immediately After Exercise						
ENERGY2						
Mean	15.06	13.00	15.78	13.03	14.31	14.76
SD	3.49	5.03	2.37	3.59	2.59	3.40
N	17.00	15.00	18.00	32.00	13.00	41.00
TIRED2						
Mean	7.94	8.40	7.44	10.63	7.54	9.80
SD	3.56	3.40	3.53	3.53	2.22	3.10
N	17.00	15.00	18.00	32.00	13.00	41.00
CALM2						
Mean	9.12	9.33	10.17	10.25	11.46	9.15
SD	2.18	2.61	2.60	3.18	3.76	2.81
N	17.00	15.00	18.00	32.00	13.00	41.00
TENSION2						
Mean	9.06	7.73	9.06	8.34	8.84	8.78
SD	2.82	2.15	2.53	2.87	1.81	2.57
N	17.00	15.00	18.00	32.00	13.00	41.00
Before Bed						
ENERGY3						
Mean	13.06	11.47	9.22	11.25	10.23	9.90
SD	4.48	4.94	3.93	3.92	5.18	3.65
N	17.00	15.00	18.00	32.00	13.00	41.00
TIRED3						
Mean	9.88	9.53	14.56	12.84	12.00	14.39
SD	4.78	3.50	4.15	4.41	4.69	4.17
N	17.00	15.00	18.00	32.00	13.00	41.00
CALM3						
Mean	10.71	11.20	15.17	11.69	11.69	12.68
SD	3.89	3.10	2.81	3.15	3.64	2.86
N	17.00	15.00	18.00	32.00	13.00	41.00
TENSION3						
Mean	9.41	8.20	6.61	8.34	8.62	8.22
SD	4.23	3.97	2.20	2.82	2.36	3.17
N	17.00	15.00	18.00	32.00	13.00	41.00

[a, b, c, d]Energy, Tired, Calm, Tension scores as measured by the AD-ACL. Scores could potentially range from 1–20.

Table 3. Correlation Matrix for Study Variables

	PPFS	MC	ENERGY1	TIRED1	TENSE1	CALM1	ENERGY2	TIRED2	TENSE2	CALM2	ENERGY3	TIRED3	TENSE3	CALM3
PPFS														
MC	0.03													
ENERGY1	0.11	–0.01												
TIRED1	0.07	–0.12	–0.46*											
TENSE1	–0.11	0.05	0.06	–0.17										
CALM1	0.03	0.01	–0.24*	0.27*	–0.24*									
ENERGY2	0.09	0.11	0.21*	–0.27*	0.11	–0.03								
TIRED2	0.01	–0.09	–0.16	0.58*	0.02	0.14	–0.53*							
TENSE2	–0.04	–0.05	0.09	–0.12	0.30*	–0.02	0.25*	0.02						
CALM2	–0.13	–0.03	–0.01	–0.01	–0.02	0.38*	–0.18*	0.12	0.02					
ENERGY3	0.14	–0.12	0.18*	–0.08	0.06	–0.05	0.26*	–0.19*	0.01	0.02				
TIRED3	–0.07	0.16	–0.14	0.22*	0.08	0.11	–0.02	0.22*	–0.09	–0.06	–0.66*			
TENSE3	0.11	–0.08	0.07	0.05	0.11	–0.12	–0.01	0.07	0.27*	0.06	0.32*	–0.28*		
CALM3	–0.09	0.14	–0.04	–0.02	0.12	0.28*	0.11	0.02	0.05	0.18*	–0.46*	0.51*	–0.43*	

*Correlation is significant at the 0.05 level (2-tailed).

related to exercise condition or gender, these variables were not used as covariates in subsequent data analyses.

A series of 3 (Exercise Condition) × 2 (Gender) ANOVAs with repeated measures were conducted on the AD-ACL mood measures. Scores obtained immediately before exercise, immediately following the exercise procedure, and scores obtained that evening before bed were used in the repeated measures procedure.

While examining the AD-ACL energy scores, the ANOVA procedure with repeated measures failed to reveal any between-subject main effects or interactions. Thus, exercise energy scores did not differ based on exercise group assignment or gender. However, a nonsignificant trend emerged while examining gender main effects [F (1, 130) = 3.72, $p < .06$]. Paired comparison post hoc analyses revealed that males tended to report higher post exercise energy scores than females.

While examining the AD-ACL tired scores, the ANOVA procedure with repeated measures revealed significant between-subject differences. A significant exercise group main effect surfaced [F (2, 130) = 4.24, $p < .05$] as well as a significant gender main effect [F (1, 130) = 8.30, $p < .05$]. Paired comparison post hoc analyses revealed that those participants who experienced the exercise procedure with others reported being more tired than those who participated in the exercise procedure alone. The mean tired score for the solo exercise group was 8.2 immediately following exercise and 9.7 later that evening, while the mean tired score for participants in the exercise with others groups were 9.3 and 9.5 immediately following exercise and 13.8 and 13.5 later that evening. Paired comparisons post hoc analyses also revealed that females generally reported higher levels of tiredness than males following exercise. The mean tired score for the females was 9.9 immediately following exercise and 13.0 later that evening, while the mean tired score for males were 7.6 immediately following exercise and 12.2 later that evening. No significant exercise condition by gender interactions surfaced.

While examining the AD-ACL tension scores, the ANOVA procedure with repeated measures failed to reach any significant main effects or interactions (all p's > .05). While examining the AD-ACL calm scores, the ANOVA procedure with repeated measures revealed a significant exercise group main effect [F(2, 130) = 5.90, $p < .05$]. Paired comparison post hoc analyses revealed that those participants who experienced the exercise procedure with others reported being more calm relative to those who participated in the exercise procedure alone. The mean calm score for the solo exercise group was 9.2 immediately following exercise and 10.9 later that evening, while the mean calm scores for participants in the exercise with others groups were 9.7 and 10.2 immediately following exercise and 12.4 and 12.9 later that evening. No significant between-

subject gender main effects or exercise condition by gender interactions surfaced.

DISCUSSION

The purpose of this study was to investigate in a laboratory setting whether social exercise improved the stress-reducing benefits gained from exercise when exercising with someone compared to exercising alone. Using a sample of 136 college students, it was found that exercise produced an overall positive immediate impact on energy, calmness, and tired levels. Furthermore, social exercise improved the stress-reducing benefits of exercise, specifically by increasing calmness after exercising with someone compared with exercising alone. Curiously, exercising with someone resulted in being more tired than exercising alone. Whether or not participants were allowed to talk or not did not affect our results; merely being with another person produced similar results.

Our results are consistent with previous research examining the positive effects of social support on weight loss, smoking cessation, and encouraging positive health behaviors (i.e., Kulik & Mahler, 1989; Jeffery & Wing, 1999; Jeffrey et al., 2000; Hall et al., 1993; Hatsukami et al., 1996; Hughes, 1993; Ockene, 1986). In addition, our results have supported previous research examining the many positive psychological benefits gained from social support, such as an increased ability to cope with stress (e.g., Sarason, Sarason, & Gurung, 1997; Dunkel-Schetter & Wortman, 1981), by demonstrating an increased level of calmness in social exercise conditions. It appears that since social support has a positive impact on many health behaviors, it would be reasonable to expect that exercising with others would enhance the stress-reducing benefits gained from exercise. Thus, exercising with someone may contribute to a calming effect due to the social aspects of the exercise experience. Exercising with others may increase tiredness due to increased competition or workload; that is, exercising with someone may create increased competition and expectations for performance. These explanations, however reasonable, are only speculative since exertion was not measured in this study.

Our findings are also consistent with the notion that the psychological benefits of exercise may be due, at least in part, to social factors (e.g., Folkins & Sime, 1981; Plante & Rodin, 1990; Plante, 1999). All participants in the current study exercised for the same amount of time and at similar intensity levels (i.e., between 120 and 150 heartbeats per minute). Yet, only those who exercised with others scored higher on calmness and tiredness than those who exercised alone. Thus, factors other than the exercise itself may have contributed to different perceptions of mood and so forth. Of course, potential physiological changes associated with social exercise (e.g., hormonal changes, blood flow) may play a role in our results but were not assessed in this study.

Limitations

While our results indicate that social exercise does appear to increase some of the psychological benefits of exercise, our findings should be interpreted cautiously for several important reasons. First, our data was gathered from a college student population only, which is fairly homogeneous in terms of age and levels of fitness. Second, our exercise procedure was conducted in a controlled laboratory session and may not be similar to exercise experiences in the field. Third, dependent measures included only self-report information that has limited reliability and validity as well as a potential bias. Fourth, findings consistent with our hypothesis were found on the calmness measure but not on the energy or tension measures. Fifth, students participating in the two social exercise conditions were randomly assigned and thus were not exercising with close friends. It is possible that exercising with close friends might provide different psychological effects. Sixth, no measures of exertion were conducted in the experiment. Results may have been due in part to different levels of perceived or actual exertion when in the presence of others. Seventh, physiological measures such as hormonal changes and blood flow were not measured in this study, and thus any physiological differences between groups are unknown. Finally, the possibility of Type I errors exist due to the multiple correlations and number of ANOVAs conducted.

Future research should continue to examine the relationship between social exercise and its impact on psychological functioning. This research should include a more heterogeneous population as well as multimodal measurements of psychological functioning. Future research should also examine the nature of the social relationships (e.g., close friends, work associates, strangers) and the exercise exertion (both perceived and actual exertion) when with others.

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